Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

Claims 1-12 (Canceled)

13. (Currently Amended) Method of controlling an accelerator coupled nuclear system (ACS) comprising a nuclear reactor, having a core, the nuclear reactor~~,~~ operating in subcritical mode, and ~~a~~ an external neutron generator device using a beam of accelerated charged particles, the external neutron generator device consuming a predetermined ~~amount~~ fraction of energy~~,~~ f^{nom}~~,~~ produced by the core in order to produce a number of external neutrons for maintaining a nuclear chain reaction in the core, and an operating point of the system being selected at a nominal charged particle energy E_p^{nom} close to an optimal energy ~~value~~ E_p^{max} for which a ~~relationship~~ ratio between the number of external neutrons produced and an energy of a beam of the charged particles used by the external neutron generator device to produce the external neutrons is maximum, the method comprising the steps of~~,~~:

for a self-regulated and reliable operation of the accelerator coupled nuclear system~~,~~ selecting the nominal charged particle energy E_p^{nom} to be greater than the optimal energy ~~value~~ E_p^{max}, and adjusting the number of external neutrons depending on operating ~~power~~ fluctuations of the nuclear reactor power by acting on the energy of the charged particles (Ep) generated and accelerated by the accelerator, wherein the accelerator is configured to be controlled by the particle energy with a constant beam intensity.

14. (Currently Amended) Method of controlling an accelerator coupled nuclear system (ACS) in accordance with claim 13, wherein the operating point of the system is determined by the nominal charged particle energy E_p^{nom} being equal to a sum of the optimal energy E_p^{max} and an energy ΔE_p selected so as to be greater than possible negative fluctuations of the charged particle energy in response to ~~the~~ negative fluctuations of the power of the nuclear reactor in the normal operating mode of the nuclear reactor.

15. (Currently Amended) Method of controlling an accelerator coupled nuclear system (ACS) in accordance with claim 13, ~~characterized in that it comprises~~comprising the following steps:

1. determining operating conditions under which the nuclear reactor is to be operated ~~including:~~the operating conditions consisting of: level of subcriticality (r_0), consumable power~~ to be produced~~, quantity of fuel and kind of fuel, wherein consumable power

is selected from a group consisting of thermal power P_{th} or electric power $P_{el} = \eta_{el}P_{th}$ where η_{el} is the electric yield of the plant~~, quantity and kind of fuel~~,

2. from the determined operating conditions, determining operating parameters of the accelerator as follows:

a - determining the optimal energy $\cancel{E_p^{Max}}$ E_p^{max} of the charged particles, which verifies the expression:

$$d/dE_p\,[\varphi^*(E_p)\eta_a(E_p)Y_n(E_p)/E_p] = 0 \qquad (1)$$

in which E_p is the energy of the charged particles, Y_n is the neutron yield, φ^* is the neutron importance, and η_a is the yield of the accelerator,

b - selecting ~~the~~an operating nominal charged particle energy E_p^{nom} to be equal to or greater than the optimal energy E_p^{max} $\cancel{E_p^{Max}}$:

$$E_p^{nom} = E_p^{max}\cancel{E_p^{Max}} + \Delta E_p,\ \Delta E_p > 0. \qquad (2)$$

c - determining a nominal intensity I_p^{nom} of the beam of charged particles necessary to obtain a nominal power P_{th}^{nom} of the reactor $\cancel{P_{th}^{nom}}$ depending on ~~a~~ the nominal charged particle energy E_p^{nom}, on the neutron yield $Y_n(E_p^{nom})$, on the yield of the accelerator $\eta_a(E_p^{nom})$, on the average number v of fission neutrons, on the energy E_{fis} supplied in a fission reaction, and on the neutron importance $\varphi^*(E_p^{nom})$ for the nominal charged particle energy E_p^{nom} according to the equation:

$$I_p^{nom} = r_0 v P_{th}^{nom}/[E_{fis}\varphi^*(E_p^{nom})Y_n(E_p^{nom})], \qquad (3)$$

as well as the ~~amount~~ fraction of ~~energy~~ power produced by the reactor that is consumed by the accelerator according to the equation:

$$f^{nom} = E_p^{nom} r_0 v/[E_{fis}\varphi^*(E_p^{nom})Y(E_p^{nom})\eta_a(E_p^{nom})\eta_{el}], \qquad (4)$$

3. setting the ~~amount~~ fraction of ~~energy~~ the power produced by the reactor that can be consumed by the accelerator as a fraction f of the total ~~energy~~ power produced by the reactor, as well as the intensity of the charged particle beam at nominal values I_p^{nom} and f^{nom} according to the following formulas:

$$I_p^{nom} = r_0 v P_{th}^{nom}/[E_{fis}\varphi^*(E_p^{nom})Y_n(E_p^{nom})], \qquad (3)$$

$$f^{nom} = E_p^{nom} r_0 v/[E_{fis}\varphi^*(E_p^{nom})Y_n(E_p^{nom})\eta_a(E_p^{nom})\eta_{el}], \qquad (4)$$

4. adjusting the number of external neutrons acting on the particle energy E_p with constant beam intensity, depending on the operating ~~power~~ fluctuations of the nuclear reactor power, according to an expression that defines the ~~fluctuation~~ variation of the energy:

$$E_p = f^{nom} P_{el} \eta_a (E_p) / I_p^{nom} \qquad (5)$$

16. (Currently Amended) Method of controlling an accelerator coupled nuclear system in accordance with ~~any of the above claims~~claim 13, in which the charged particles are protons, and the neutron-generating nuclear reaction is a spallation reaction.

17. (Previously Presented) Method of controlling an accelerator coupled nuclear system in accordance with claim 16, in which the spallation target is made of lead-bismuth, and the optimal proton energy E_p^{Max} ranges from 0.5 GeV to 2.5 GeV.

18. (Withdrawn - Currently Amended) Method of controlling an accelerator coupled nuclear system in accordance with ~~any of the claims~~claim 13 ~~through 15~~, in which the charged particles are electrons, and the neutron-generating nuclear reaction is a photonuclear reaction.

19. (Currently Amended) Accelerator coupled nuclear system comprising a nuclear reactor, having a core, operating in subcritical mode and ~~a~~ an external neutron generator device using a beam of accelerated charged particles, the external neutron generator device consuming a predetermined amount of energy f^{nom} produced by the core in order to produce a number of external neutrons for maintaining a nuclear chain reaction in the core, and an operating point of the system being selected at a nominal charged particle energy ~~value~~ E_p^{nom} close to an optimal energy ~~value~~ E_p^{max} for which a ~~relationship~~ ratio between the number of external neutrons produced and an energy of the charged particle beam used to produce the external neutrons is maximum, ~~the system comprising~~wherein, for a self-regulated and reliable operation, ~~it comprises means for selecting~~ the nominal charged particle energy E_p^{nom} is selected so as to be greater than the optimal energy ~~value~~ E_p^{max}, and, the system comprising means for acting on the energy (E_p) of the charged particles generated and accelerated by the accelerator for adjusting the number of external neutrons depending on operating ~~power~~ fluctuations of the nuclear reactor power by acting on (E_p), the energy of the charged particles ~~(Ep)~~ generated and accelerated by the accelerator.

20. (Currently Amended) ~~System~~ An accelerator coupled nuclear system in accordance with claim 19, further comprising means for determining the operating point of this system by a nominal charged particle energy E_p^{nom} equal to a sum of the optimal energy E_p^{max}

and an energy ΔE_p selected so as to be ~~much~~ greater than possible negative fluctuations of the charged particle energy in response to ~~the~~ negative fluctuations of the power of the nuclear reactor in the normal operating mode of the nuclear reactor.

21. (Currently Amended) Accelerator coupled nuclear system in accordance with claim 19 ~~or 20~~, wherein the charged particles are protons directed in a beam at a central part of the core, and the core comprises a spallation target.

22. (Withdrawn) Accelerator coupled nuclear system in accordance with claim 21, in which the spallation target is surrounded by a buffer, having a conversion yield that is less than half of a conversion yield of the spallation target.

23. (Currently Amended) Accelerator coupled nuclear system in accordance with claim 19 ~~or 20~~, comprising a target for producing the neutrons in response to the charged particles, the target having an optimized geometry which increases losses of the charged particles in this target.